Journal of Cleaner Production 224 (2019) 361–374

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Circular business models: Business approach as driver or obstructer of sustainability transitions?

Florian Hofmann [a, b, *]

[a] Fraunhofer-Institute for Reliability and Microintegration, Department Environmental and Reliability Engineering, Gustav-Meyer-Allee 25, 13355, Berlin, Germany

[b] Technical University of Berlin, Faculty of Economics and Management, Department Strategic Leadership and Global Management, Straße des 17. Juni 135, 10623, Berlin, Germany

ARTICLE INFO

Article history:
Received 30 June 2018
Received in revised form
27 February 2019
Accepted 11 March 2019
Available online 16 March 2019

Keywords:
Circular economy
Circular business model
Sustainable business model
Business model innovation
Sustainability transitions

ABSTRACT

In times of climate change, biodiversity loss, or growing natural resource scarcity, the circular business model (CBM) concept is increasingly attractive, promoting the reorganization of current value creation architectures and supply chains toward a sustainable system of production and consumption. Driven by a vision of continued economic expansion and growth on a planet with finite natural resources, CBMs are endorsed by political institutions, multinational corporations, business consultancies, and academia. Some argue that CBM configurations contribute to a more holistic and radical change in the existing business logics than approaches that achieve incremental resource efficiency improvements. However, how "holistic" and "radical" are CBMs theoretically constituted in academia if we consider the deep structural and paradigmatic shifts in societies necessary to deal with the challenges associated with the Anthropocene? Prior studies do not examine the inherent normative settings and the operational change approaches beneath CBM concepts. To reconstruct the theoretical foundations of CBMs critically, the recent CBM body of academic literature is systematically reviewed according to (1) the legitimacy of CBMs (why should it be done) (2) the modes of value creation and offerings (what should be done), and (3) the core principles of CBM integration into daily business (how should it be done). From this synthesis, the predominant notion of sustainability behind the CBM concept can be revealed. This study argues contemporary scientifically constructed CBMs need to be reconsidered if they are intended to contribute to a profound economic transition toward sustainability. Hence, the paper shows how principles from more "holistic", "radical", and pluralistic economic approaches can widen CBMs and how future research can help to diversify the concept.

1. Introduction

In light of various interrelated ecological, social, and economic problems, an increasing number of political, academic, and economic actors worldwide endorse fundamental societal change as inevitable in order to move toward sustainability (ISDRI/SDSN, 2015; IPCC, 2014; Schubert et al., 2011; Steffen et al., 2015; UN, 2015). Climate change, biodiversity loss, or social inequality are symptoms of persistent problems rooted profoundly in social structures (Rotmans and Loorbach, 2009; Schuitmaker, 2012). Some authors claim that a radical reorganization of our socio-technical systems by transitioning to sustainability is necessary to overcome these interlinked problems (WBGU, 2011; Markard et al., 2012; Wittmayer et al., 2018).

One possible economic transition pathway that attracted growing interest from politicians, scientists, and corporate representatives recently is the concept of a circular economy (CE; Geissdoerfer et al., 2017; Ghisellini et al., 2016; Kirchherr et al., 2017; Korhonen et al., 2018; Murray et al., 2017; Rizos et al., 2017; Su et al., 2013). It aims to keep extracted natural resources in use as long as possible and seeks to preserve the maximum value of products through reuse and recovery strategies. The main objective of this approach is to "achieve the decoupling of economic growth from natural resource depletion and environmental degradation" (Murray et al., 2017: 373). There is a consensus that CE can help

* Corresponding author. Fraunhofer-Institute for Reliability and Microintegration, Department Environmental and Reliability Engineering, Gustav-Meyer-Allee 25, 13355, Berlin, Germany.
E-mail address: florian.hofmann@izm.fraunhofer.de.

https://doi.org/10.1016/j.jclepro.2019.03.115
0959-6526/

restructure the current "take-make-dispose" economic system (Merli et al., 2018; Pearce and Turner, 1989).

The European Commission, several national governments (e.g., the Netherlands, Japan, and Germany), and economic think tanks (like the Ellen MacArthur Foundation, EMF) assume that one powerful lever for the shift from a linear economy toward a CE is bound to innovations among incumbent companies and entrepreneurs (Bastein et al., 2013; BMUB, 2016; EAJ, 2013; EC, 2016; EMF, 2013; Murray et al., 2017; Su et al., 2013). The general position is that the change to a resource-efficient society will be driven by the creative abilities of private corporations in setting economic signals such as recovery targets and quotas, providing economic incentives and assistance such as preferential government procurement programs, and funding research projects to experiment and implement CE logic into daily business routines (Moreau et al., 2017; Zink and Geyer, 2017). Thereby, the business model (BM) construct received increasing attention as an instrument to integrate CE principles into business. Academic research increasingly focuses on circular business models (CBMs) in addition to closed loop supply chains and circular product design (Geissdoerfer et al., 2017; Merli et al., 2018). Moreover, leading consultancies (like McKinsey as a knowledge partner of the EMF, Boston Consulting Group, or Accenture) invest in exploring and communicating the CBM concept to build competencies and create future market opportunities (EMF, 2017; Lacy et al., 2014; Rubel et al., 2018). All of these actors perceive CBMs as a catalyst for a sustainability transition of the current industrial economic system.

Considering this rather business-driven transition approach, there is a need for a critical reflection on the communicated desirable future conditions, the logics of economic value creation, and the proposed practices that underlie the CBM concept, particularly for the expectation that CBMs contribute to a sustainable system of consumption and production. A detailed analysis of why and how CBMs should be integrated into businesses can provide insights into the underlying notion of sustainability. Thus, this study contributes an examination of how the understanding of sustainability is subject to the CBM concept and how the transition toward sustainability is envisioned by systematically reviewing the recent CBM literature. The selected 42 scientific articles have been critically reconstructed into three categories: (1) the substantiated general aims of CBMs, (2) the modes of value creation and offerings of CBMs, and (3) the core principles of CBM integration into daily business. This condensed description allows for a structured examination and evaluation of the normative and operative settings of the theoretical foundations of CBMs in terms of why is the implementation of CBMs desirable (objectives/normative dimension); the definition of the corridor of action (modes of value creation and offerings/strategic dimension); and the operative, concrete, and affordable solutions that can be implemented now (core principles of integration/operational dimension). Building on the findings, conceptual amendments can be outlined that provide a more differentiated understanding of the role of CBMs in the transition to sustainability. Furthermore, the paper generates insights into future research directions.

The paper is structured as follows. Section 2 covers a brief literature overview that introduces the linkages between CE, BMs, and sustainability transitions. Section 3 describes the systematic literature review process and Section 4 summarizes the main findings, which are aggregate into a framework that is called the "reference frame of circular business model conceptions". This is followed with a discussion of whether and to what extent CBMs contribute to an economic transition toward sustainability, which leads to the identification of aspects for diversifying CBMs conceptually and future research investigations (Section 5).

2. The linkages between CE, sustainability transitions, and BMs

The CE concept stems from various schools of thought with intensive debate in the literature. Several authors, such as Ghisellini et al. (2016), Homrich et al. (2018), Murray et al. (2017), Rizos et al. (2017), and Su et al. (2013), emphasize that Pearce and Turner (1989) proposed the concept of CE based on the ideas of ecological economist Kenneth Boulding (1966). Boulding described planet earth as a closed and circular system and transferred this metaphorical narrative to a future economy, in which the outputs of all system entities serve as inputs for other entities. "The closed economy of the future might similarly be called the 'spaceman' economy, in which the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy" (Boulding, 1966: 7–8). Pearce and Turner (1989) emphasized that nature functions as a resource supplier for production and consumption inputs, as a sink for anthropogenic emissions, as well as a source of deeper feelings "to be in the world" in the form of aesthetic enjoyment and spiritual comfort. Based on their analyses of environment-economy interrelations, they stressed, "if we ignore the environment then the economy appears to be a linear system" (Pearce and Turner, 1989: 34). They characterized the current industrial economy as an open system that leads to the erosion of the interrelated ecosystems of planet earth and causes irreversible changes in the essential human life-supporting functions of nature (Geissdoerfer et al., 2017). A closed and circular economic system in turn seeks to maintain the total capital stock of natural resources considering the laws of thermodynamics (Ghisellini et al., 2016; Pearce and Turner, 1989; Rizos et al., 2017). Nevertheless, the term linearity simplifies today's complex economic processes as one-directional and instrumentally controllable sequences, and implies value creation networks as well as material flows with defined beginning and ending points. But even in the contemporary "cowboy economy" ("the cowboy being symbolic of the illimitable plains and also associated with reckless, exploitative, romantic, and violent behavior …" Boulding, 1966, 7), products and components with seemingly limited lifetimes and value appreciations can be described partially as continuous, without a final act of consumption (Lepawski and Mather, 2011). For example, an iPod (first marketed at the beginning of the 2000s) could be used as a "living room artifact" for bringing back memories after its "official product death" due to its irreparability. The function of the iPod has changed over time from a random portable music player to a medium of reminiscences and experienced emotions. Another example is ocean plastic, which some termed as the epitome of linearity while others perceive it as a source of value (e.g., manufacturer of recycled sneakers). Future technological progress could reverse the extremely urgent problematic of ocean plastics into new opportunities of economic performances. When does value end, when does waste emerge? Consequently, the determination whether an observed system is linear or not depends heavily on the scope, the predefined system boundaries and time scales. A strict distinction between linearity and circularity can only function as a theoretically abstraction (as used in the following argumentations) for the purpose of sensitizing and addressing a superior problem, namely the kind of economic activities that build on the massive degradation of nature.

Over the last several decades, a body of literature arose from diverse research disciplines and practice that contributed to the common understanding and interpretation of the CE concept (Ghisellini et al., 2016; Lieder and Rashid, 2016; Murray et al., 2017;

Rizos et al., 2017; Sauvé et al., 2016). Some of the most important conceptual approaches that influenced the theoretical roots of CE are "cradle-to-cradle" (McDonough and Braungart, 2002), "industrial ecology" (Graedel and Allenby, 1995), "industrial metabolism" (Ayres, 1994), "biomimicry" (Benyus, 2002), "blue economy" (Pauli, 2010), and "natural capitalism" (Lovins et al., 1999; Homrich et al., 2018). One of the most frequently quoted definitions (Geissdoerfer et al., 2017; Rizos et al., 2017) that links different elements from these schools of thought was formulated by the EMF, which emphasizes the CE as "an industrial economy that is restorative by intention and design" (EMF, 2013: 14). Ghisellini et al. (2016: 12) describe CE as a holistic approach that accelerates deep social change by arguing, "CE has the potential to understand and implement radically new patterns and help society reach increased sustainability and wellbeing at low or no material, energy and environmental costs."

The argument from a systems perspective of change is in line with the insights of sustainability transition research, which states that a shift toward sustainability is possible only through far-reaching structural systemic changes along material, economic, political, institutional, organizational, and socio-cultural spheres (Grin et al., 2010; Markard et al., 2012; Wittmayer et al., 2018). Sustainability transitions are multi-dimensional, long-term, and fundamental change processes through which established societal cultures, structures, and practices shift to more sustainable ones that arise from the co-evolution between the economy, society, and ecology (Grin et al., 2010; Loorbach and Wijsman, 2013). As part of such a transition, sustainable "products, services, business models, and organizations emerge, partly complementing and partly substituting for existing ones" (Markard et al., 2012: 956). Particularly in the transition to sustainability, guidance and governance often play a major role. This kind of systemic change is purposeful and intended, while a broad range of societal actors work together in a more or less coordinated way (Markard et al., 2012; Rotmans and Loorbach, 2009; Smith et al., 2005) and are informed and motivated by normative frameworks like the Sustainability Development Goals (SDGs; UN, 2015), social and planetary boundaries (Leach et al., 2013; O'Neill et al., 2018; Rockström et al., 2009; Steffen et al., 2015), or concepts such as the CE. In the CE discourse, scholars and practitioners from politics, businesses, and consultancies often emphasize the importance of BMs for achieving systemic change to a CE. "Business models have been ascribed the potential to disrupt entire industries, because they connect multiple actors, mediate between the production and the consumption side of business and support the introduction of novel technologies into the market" (Bidmon and Knab, 2018: 903).

BMs are simplified descriptions of the mechanism of how an organization creates, offers, and delivers value to their key stakeholders through the conversion of scarce resources (Chesbrough, 2010; Amit and Zott, 2001; Osterwalder and Pigneur, 2010; Teece, 2010; Wirtz et al., 2016; Zott et al., 2011). As Magretta (2002: 4) observed, BMs represent a new form of narrative in management theory: "Business models are … at heart stories — stories that explain how enterprises work." Hence, BMs articulate what value a company offers to fulfill the customer needs (value propositions/offerings), the structure of the value creation activities and resources (value creation infrastructure), and how the company captures financial value (value capture; Bocken et al., 2013; Johnson et al., 2008; Massa et al., 2017; Osterwalder and Pigneur, 2010; Zott and Amit, 2010).

From the perspective of CE advocates, in a Schumpeterian process of creative destruction (Schumpeter, 1934), CBMs should innovate the conventional "take-make-dispose" value creation (and destruction) patterns, products and services, market formations, and consumption practices by replacing them with ones that incorporate CE principles. CBMs can help firms create economic value through using materials or existing products and components in multiple-use cycles (Lüdeke-Freund et al., 2018; Manninen et al., 2018). Overcoming linear BMs requires that firms redesign and reorganize their value propositions, value creation infrastructures, and value capture models. Corporations that adapt CBMs are deeply involved in the product usage phase, which leads them to rethink classical producer-consumer relationships. The conceptual logic "is based on utilizing the economic value retained in products" (Linder and Williander, 2015: 2) and substituting primary finite natural resource inputs with recycled or renewable materials to avoid producing waste (Lewandowski, 2016; Moreno et al., 2016; Nuβholz, 2017).

Not only in politics and economics, but also in the academic literature, CBMs are considered as a driver of sustainable development. They are a subcategory of BMs for sustainability, so both literature streams are closely related (Antikainen and Valkokari, 2016; Bocken et al., 2014; Lewandowski, 2016; Lüdeke-Freund et al., 2018; Manninen et al., 2018). Some argue that CBMs as a sustainable business approach demonstrate a fundamental shift in doing business from the contemporary paradigm of just creating customer value to enhance the firm's financial performance to the recognition that firms depend on the complex, intertwined relationships between society and nature. They go beyond financial rationalities by extending the traditional concept of monetary business success with stakeholder and ecological aspects. Thus, the stated overarching goal of CBMs, besides improving financial performance, is to preserve ecosystems and contribute to a "positive development of society as well as the economy" (Planing, 2018: 73).

In summary, it can be stated that the CE concept provides political guidance for sustainability transition governance, and portrays a positive vision of the future economy in times of climate change, large-scale ecosystem degradation, and rising risks of global supply shortfalls. BMs are particularly important as levers for "the process of industrial mutation" (Schumpeter, 1976: 83), as firms with CBMs innovate the actual consumption and production structures from within toward sustainable practices of living, manufacturing, and consuming. We can assume that political, economic, and academic actors broadly agree that CBMs provide a response to the unsustainable social pathways we face. Consequently, political and academic institutions are supposed to facilitate firms to operationalize CBMs through economic incentive systems as well as knowledge generation, knowledge transfer, and knowledge integration.

3. Research design

A science that defines sustainability as its normative context of research must refer to the controversial discourses on current trends to reconstruct them critically. Therefore, we can also describe sustainability science as a critical science (Jahn, 2015). On the one hand, a critical science scrutinizes and examines current unsustainable societal developments such as the overuse of natural resources or social disparity to provide knowledge about the system dynamics that lead to unsustainable outcomes. Moreover, it creates knowledge to open potential corridors for various trajectories toward more sustainable conditions and explores the existing concrete solutions (Hirsch Hadorn et al., 2006). On the other hand, criticism means a methodologically guided self-reflection about the production of knowledge and the concepts that practitioners use in pursuing their own goals (Jahn, 2015). This study contributes to the second track; it offers a reflection on the CBM concept in the scientific literature. To develop a critical analytical perspective on the theoretical foundations of CBMs, a systematic literature review has been conducted to discuss the normative,

strategic, and operative assumptions in terms of (1) the raison d'être of CBMs (why should it be done/normative dimension), (2) the directional specification of long-term viable value creation activities (what should be done/strategic dimension), and (3) the existing concrete and affordable solutions that firms can realize now to conduct CBMs (how should it be done/operative dimension). The three dimensions of investigation are derived from the integrative management approach of structuring management reference frames to solve problems in times of accelerated social and economic change dynamics based on Bleicher (1994) and adapted by e.g., Breuer and Lüdeke-Freund (2017), Rüegg-Stürm and Grand (2016), or Schwegler (2009). The system-theoretical approach assumes that effective value based management is composed of those three mutually related dimensions which support business developers in searching, assessing, and applying new business concepts in changing environments and contexts. While the normative dimension encompasses the purpose of business activities, the strategic dimension depicts the definition, direction and orchestration of those activities, whereas the operational dimension covers the integration of them into daily business practice (Bleicher, 1994). Hence, it was used for creating a segmented reconstruction of the CBM research to provide insights into the understanding of sustainability beneath CBM conceptions in academic literature.

A literature review gathers and interprets the existing landscape of knowledge with reference to a specific topic. This allows identifying aspects of a phenomenon (here, CBMs) that are missing, incomplete, or poorly represented (Torraco, 2005). Consequently, a literature review exposes the missing knowledge to develop the existing body of knowledge further and thus to raise questions for future research (Denyer and Tranfield, 2009; Tranfield et al., 2003). The systematic literature review was selected and preferred to the 'normal' or 'ordinary' literature review for several reasons. The search process is rule-driven and more rigorous than in a 'normal' review. There has to be an explicit statement of the basic parameters (e.g., the definition of search terms and strings, publications types, citation databases) that are being applied in order to minimize biases and error (Jesson and Lacey, 2006). In contrast to an 'ordinary' review, in a systematic literature review the researchers must adopt a replicable and transparent research process by revealing their decisions, procedures, and conclusions. Documenting the review steps helps to ensure a certain degree of transparency by describing the search strategy to identify relevant studies. In addition, a prerequisite for conducting a systematic literature review is a concise description of the quality criteria for the inclusion and exclusion of studies (Tranfield et al., 2003).

The following subsection describes the first four steps of the review process, while the fifth step is presented in Section 4 to specify and discuss the findings. The systematic literature review methodology was adapted from Denyer and Tranfield (2009), Lüdeke-Freund et al. (2016), Torraco (2005), and Tranfield et al. (2003):

1. Definition of search terms and search strings
2. Definition of publication types
3. Definition of citation databases
4. Study selection and evaluation
5. Synthesis of the selected literature body

Search terms and search strings. The defined search terms were obtained from the keyword lists of frequently cited core publications, including the studies by Bocken et al. (2016), Lewandowski (2016), Linder and Williander (2015), and Rizos et al. (2016; Fig. 1). The scope of the review was limited to the academic literature that explicitly refers to the CBM concept. Studies that investigated BMs for sustainability, Product-Service-Systems (PSSs), or closed-loop manufacturing that do not explicitly consider search terms were excluded from the review to keep the scope manageable.

Publication types. The scope of the review process included peer-reviewed scientific journal articles, conference proceedings, and hand-selected grey literature with a focus on publications in English. It seemed to be suitable to extend the database by adding conference proceedings and grey literature publications beside peer-reviewed journal articles due to the novelty of this research field. Derived from the novelty, no specific timeframe was set. The search was conducted at the beginning of March 2018.

Citation database. The systematic literature review builds on the three major citation databases for peer-reviewed literature in social sciences: Scopus (limited to social sciences), Web of Science (Core Collection: Citation Index), and EBSCO (Business Source Complete). The search process returned 217 articles from Scopus, 146 from Web of Science, and 66 from EBSCO.

Study selection and evaluation. After deleting duplicate results from the initial sample, 141 articles still remained, which were screened according to their titles, abstracts, and main text to ensure relevance to the research topic. This process left 33 papers that met the predetermined quality selection criteria. In addition, nine influential publications and book sections from consulting companies and knowledge hubs (such as the EMF and the WBCSD) were added because they combine BM and CE topics from a business angle. These articles were detected through further web searches and personal expert recommendations.

The selection criteria were formulated in broad terms to avoid an overly narrow focus and to explore the boundaries of the topic while integrating as many factors as possible in this expanding research field. Literature contained in the review process was selected mainly according to four quality criteria adapted from Lüdeke-Freund et al. (2016). First, CBMs must be interpreted as a theoretical framework or construct beyond a vague expression. Second, CBMs must be considered as a management or entrepreneurial concept; that is, to enable circular value creation activities or to analyze CBM change processes, for example. Third, the paper must focus on both BM theory/conception and CE. With this criterion, research streams on sustainable BMs, BMs for sustainability, PSSs, reverse logistic systems, closed-loop manufacturing, sustainable supply chain management, and so on were excluded. Fourth, articles discussing and presenting case studies on CBM were also collected.

During the article screening process, the inclusion and exclusion criteria were gradually refined. This led to robust and appropriate quality criteria that ensure to meet the intended aim of this study.

The selected articles were thoroughly examined using structuring content analysis with the deductive category application according to Elo and Kyngäs (2007) and Mayring (2015, 2000). Content structuring aims to select certain topics, contents, and aspects from the object of research (here, scientific literature) to summarize them. Deductive category application works with prior formulated theoretical derived aspects of analysis to connect them with the text.

In this study, structuring content analysis was used to synthesize the articles into an overarching framework that illustrates the essential orientation variables for determining the notion of sustainability that underlies the CBM concept. Considering the research objective, the category system of the framework was predefined in the main categories "proposed main objectives" (why should it be done), "modes of value creation and offerings" (what should be done), and "core principles of integration" (how should it be done). After the main categories were defined, the data was reviewed and coded according to them. The text passages extracted

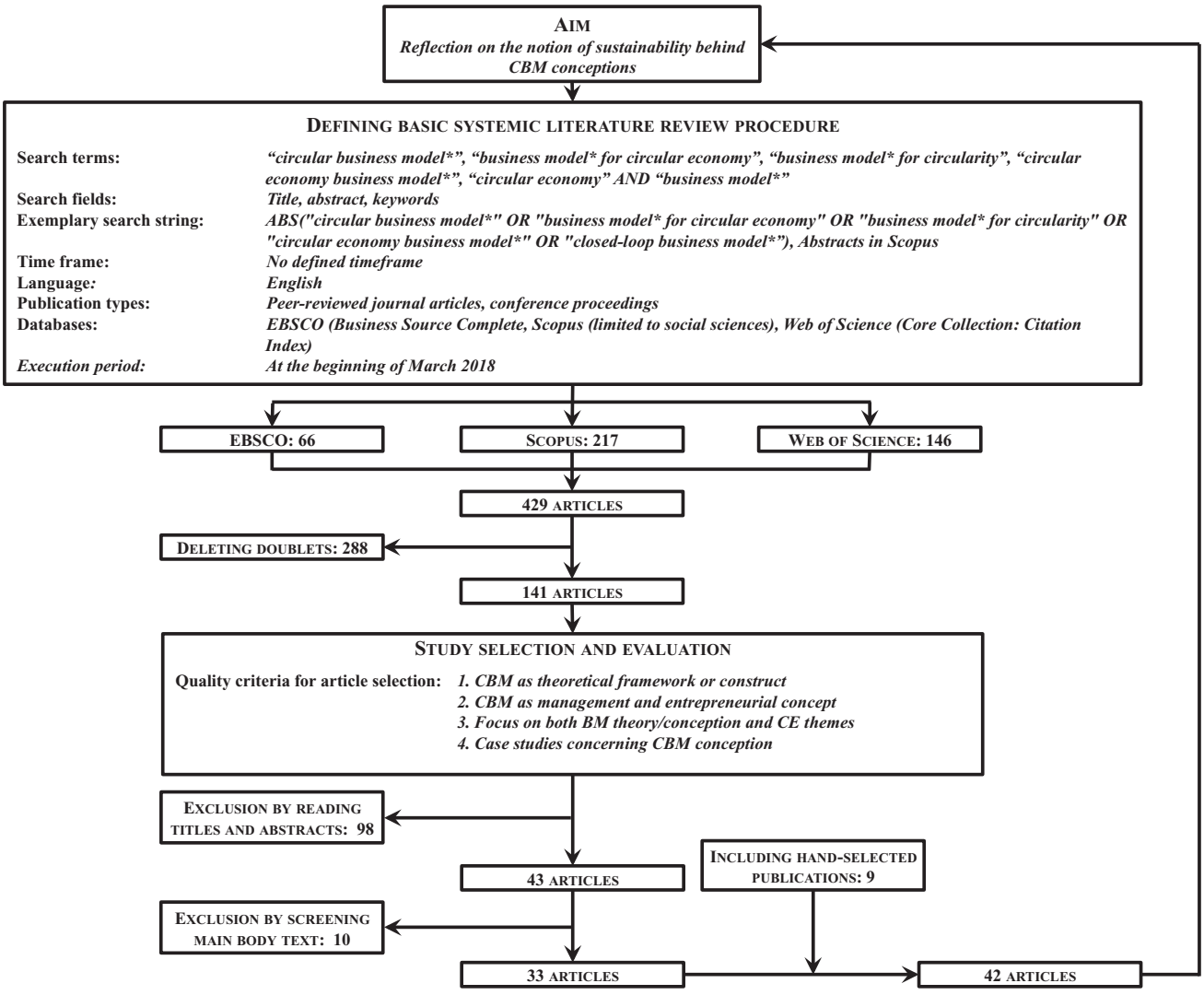

Fig. 1. Study sample selection process.

and assigned to the main categories were then divided into generic sub-categories. It was intended to apply generalized and wide-ranging terms for the sub-categories to minimize the number of them, and reduce the complexity of the framework. For example, Fig. 2 shows how the initial extracted text passages on the aims of CBMs were coded into two generic sub-categories, which in turn define the main category of "proposed main objectives." In Fig. 3 the "reference frame of circular business model conceptions" illustrates the results of the abstraction procedure.

4. Results

The "reference frame of circular business model conceptions" in Fig. 3 reports the results from synthesizing the 42 publications into a framework. Based on the three guiding questions, it offers structured knowledge about the overall theoretical framing of CBMs considering assumptions about normative and strategic settings as well as operational arrangements. It serves as a basis to discuss the notion of sustainability critically. There are mutual interdependencies between the three main dimensions "proposed main objectives," "modes of value creation and offerings," and "core principles of integration", which are discussed in the following subsections. Thus, they are not to be interpreted as clearly separated static entities, but as dynamic and interrelated reference dimensions.

At first, the findings for each main category are introduced, after which a second step shows how the generic sub-categories are discussed critically in the academic literature.

4.1. Proposed main objectives – why should it be done?

The specification of target paths enables to identify the priorities of an examined business approach. The emphasized general aims represent a reflection of which social problems need to be addressed by the approach that in turn inescapably raise the question about the justification of existence. In CBM research, decoupling growth from natural resource consumption and resilience are the most frequently mentioned primary rationales for implementing CBMs in practice (Table 1). Hence, they can be interpreted as the raison d'être of the CBM concept.

Decoupling. Many authors (e.g., Bressanelli et al., 2017; Heyes et al., 2018; Lewandowski, 2016) argue that the concept of CBM recently received the "attention of academia and businesses and decision makers offering an attractive solution for an

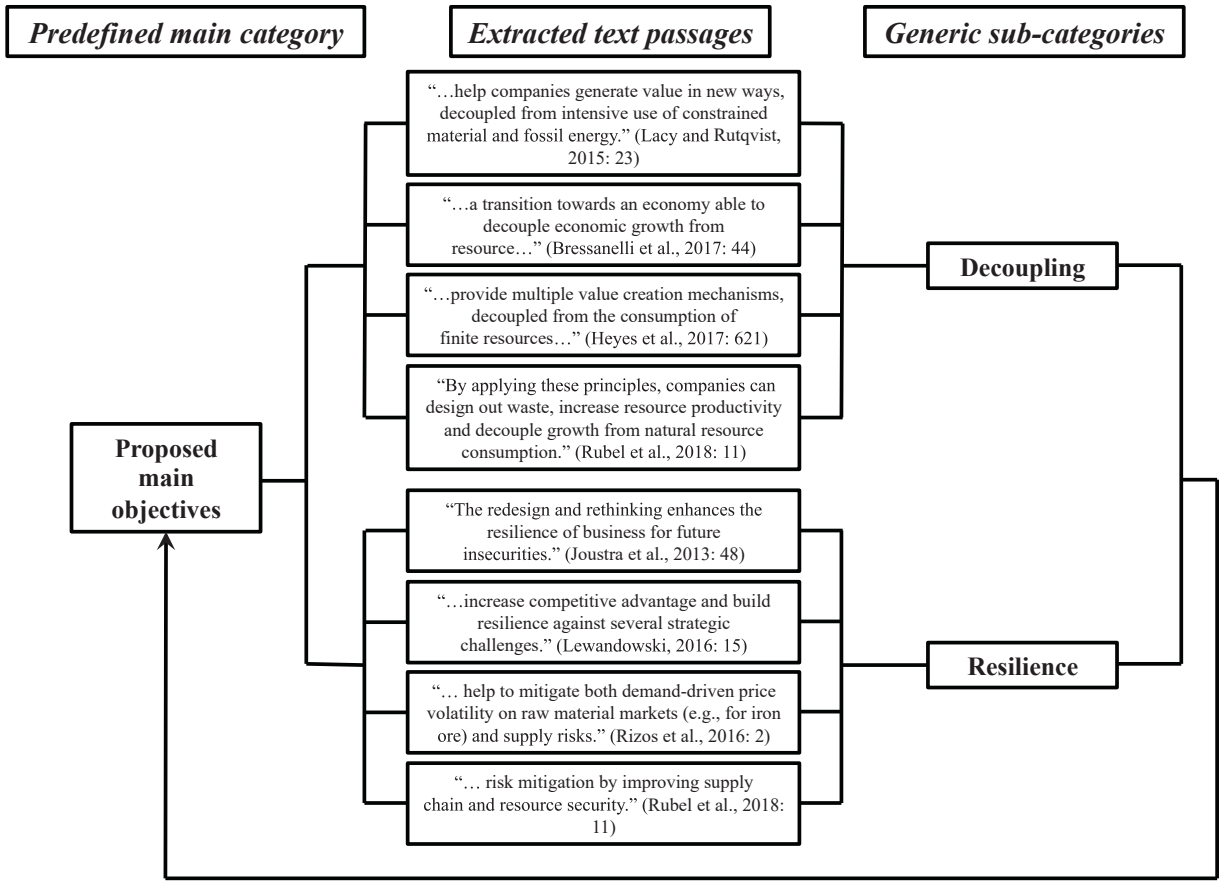

Fig. 2. Example of the abstraction process: Identifying generic sub-categories of the predefined main category "proposed main objectives" of CBMs.

environmentally sustainable economic growth" (Antikainen et al., 2017a: 1). The initial argument is that CBMs allow companies to design out waste and to increase their resource productivity, with the result of decoupling growth from natural resource consumption. The change from linear coordinated business processes to circular value creation activities and competencies represents an opportunity for business innovation "to help make the company more efficient and competitive in the areas such as sourcing, product development, and production processes" (Rubel et al., 2018: 11). Therefore, CBMs are perceived as an approach to lower material and production costs due to lower demand for energy and physical resource inputs (e.g., Nuβholz, 2017; Rizos et al., 2016; Schulte, 2013). Apart from efficiency efforts that can be categorized as practices to achieve relative decoupling, CBMs are associated with the idea to dematerialize the current industrial value creation logics through the shift from manufacturing and selling physical goods to offering capabilities and services (e.g., Bressanelli et al., 2017; Jukka-Pekka et al., 2016; Urbinati et al., 2017). Intangible value creation structures tend to be decoupled from objects, in comparison to the traditional focus on manufacturing physical products, but they nevertheless depend on supporting infrastructures and networks or even products to provide dematerialized solutions to consumer needs (e.g., digital infrastructures or/and smart devices). The initial change to immateriality is largely motivated by the rationale that service provision, in times of increasing competition as a result of globalization processes, might offer new paths towards growth (Bates et al., 2003; Sawhney et al., 2004) while simultaneously reducing the resource and energy consumption absolutely (Rothenberg, 2007). Despite the financial benefits of post-materialized business configurations and the improved operational efficiency, the reviewed articles often highlight deeper customer interactions. Among others, Lewandowski (2016), Lüdeke-Freund et al. (2018), and Rubel et al. (2018) stress that circular value propositions with leasing, rental, or performance contracting offer new ways to engage customers to establish and strengthen long-term relationships. This in turn provides firms the possibility to gain precise customer insights into usage patterns. Thus, firms can tailor their offerings better to meet customers' individual requirements and needs and ensure a higher level of satisfaction. Moreover, circular value propositions can attract new environmental-conscious customer segments that represent both profit and growth opportunities.

Resilience. Beside the primary objective of decoupling economic growth from natural resource consumption, authors such as Joustra et al. (2013), Lacy and Rutqvist (2015), and Roos (2014) emphasize that the shift to a CBM leads to more autonomy and independence from international commodity markets. With the rising volatility of raw material prices and expected growing resource scarcity, the risk of potential supply shortages also increases. Furthermore, geopolitical uncertainties and tensions, as well as natural disasters, can threaten the supply of production inputs. To overcome the vulnerability to supply risks, CBMs strengthen business resilience and robustness. Using recycled materials as input factors or adopting a stewardship role to retain product ownership through service-oriented and performance-oriented BMs help secure operational reliability (e.g., EMF, 2013; Franco, 2017; Rubel et al., 2018).

4.1.1. Criticism

The imperative of growth and the emergence of rebound effects or

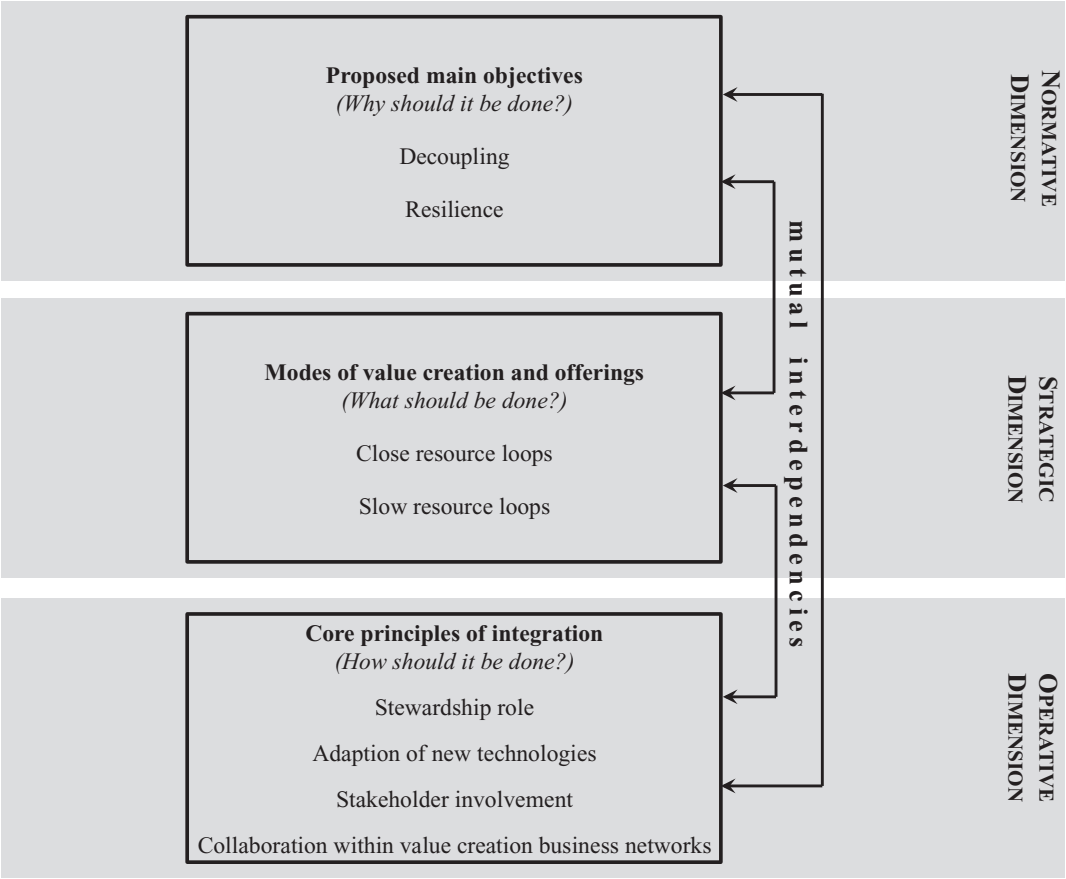

Fig. 3. Reference frame of circular business model conceptions.

Table 1
Proposed main objectives of CBMs.

Aims of CBMs	Authors
Decoupling Decouple economic growth from natural resource consumption	Antikainen et al. (2017a); Antikainen and Valkokari (2016); Bressanelli et al., (2017); Bressanelli et al. (2018); EMF, 2013; Gnoni et al. (2017); Heyes et al. (2018); Joustra et al. (2013); Jukka-Pekka et al. (2016); Lacy and Rutqvist (2015); Manninen et al. (2018); Moreno et al. (2016); Planing (2018); Rubel et al. (2018); Schulte (2013); Urbinati et al. (2017); Whalen et al. (2017); Witjes and Lozano (2016).
Resilience Reduced vulnerability to supply risks	EMF, 2013; Franco (2017); Heyes et al. (2018); Joustra et al. (2013); Lacy and Rutqvist (2015); Lewandowski (2016); Lüdeke-Freund et al. (2018); Rizos et al. (2016); Roos (2014); Rubel et al. (2018); Planing (2018); Velte and Steinhilper (2016); Whalen et al. (2017).

backfire. We can reasonably assume that CBMs reduce production input costs for natural resources and thus avoid the exploitation of virgin materials. Nevertheless, firms might invest the cost savings into business growth strategies such as expanding production capacity and new offerings, which cause direct and/or indirect systemic rebound effects. As Bocken et al. (2018), Florin et al. (2015), Lüdeke-Freund et al. (2018), Manninen et al. (2018), and Nuβholz (2017) note, there is substantial uncertainty on the positive environmental impacts of CBMs, and if they can trigger system-wide backfire by increasing the overall production and use of products, and therefore the consumption of natural resources. Hence, firms must initiate CBMs such that they avoid an additional environmental burden by considering the potential negative feedback loops in the early stages of the CBM design and evaluation process. To reduce the risk of rebound effects, Bocken et al. (2016) suggest designing business configurations based on consumer education by applying a "non-consumerist approach to sales and marketing" (Bocken et al., 2016: 314) to raise awareness of over-consumption and influence consumer behavior (e.g., choice restrictions to reduce access to unsustainable products; Bocken and Short, 2016). Furthermore, value propositions focusing on sufficiency and slowing down resource flows, such as slow fashion, slow food, or slow electronics, including reliable and reparable products with a high degree of customer support, can help to prevent boomerang effects (e.g., repair services, warranty extensions, guaranteed spare parts availability).

The absence of the social dimension. As we mentioned above, the concept of CBMs is considered to be a driver for a sustainable transition of consumption and production patterns, though it targets and prioritizes financial rationalities and environmental benefits, while only implying the social dimension of sustainability (Antikainen et al., 2017a; Bocken et al., 2018; Bressanelli et al., 2017; Manninen et al., 2018; Murray et al., 2017). Transparency and social justice in value creation networks, violation of human rights and democratic principles, or reducing social disparities are just a few issues in the social sphere of sustainability the defined objectives do not address, and thus do not appear in the conceptualization of CBMs. The reviewed articles do not discuss potential solutions to

overcome this shortfall or to integrate aspects of the social dimension into the CBMs.

4.2. Modes of value creation and offerings – what should be done?

The strategic dimension of the "reference frame of circular business model conceptions" comprises the creation of the conditions for long-term viability of CBMs discussed in literature. It defines the organizational DNA in terms of what should a circular oriented corporation do in order to convert resources and abilities into economic value. While the normative dimension discusses the legitimacy of CBMs, the strategic dimension defines the modes of value creation and offerings and covers the composition and navigation of those.

The difference between the logics of CBMs and linear oriented BMs plays an important role in the academic discourse (Nuβholz, 2017). To make such a distinction, the framework categorizes the modes of circular value creation and offerings according to the structure of how natural resources and materials flow within the economic system (Tables 2 and 3). This classification builds on the work by Stahel (2010), McDonough and Braungart (2002), and Bocken et al. (2016), who characterize two fundamental changes toward CBMs that expose the heterogeneity in linear ones: close and slow resource flows. These two strategies of circularity are sometimes combined with the approach of "narrowing resource flows." It aims to use fewer material and energy inputs per manufactured product, which means that it does not stipulate the circular use of products and materials (Bocken et al., 2016). As Lüdeke-Freund and colleagues (2018: 19) point out, "the narrowing loops strategy also fits in the current linear economy, whereas slowing and closing resource loops clearly typify a CE." Thus, the "reference frame of circular business model conceptions" does not consider the "narrowing resource flows" strategy.

Close resource loops. The modes of value creation and offerings to close resource loops implies, firstly, the collecting and processing (down- and up-cycling) of actual waste products, product components or materials with the intention to convert these into new forms of value (recycled materials or products based on recycled materials) and, secondly, the repurposing of byproducts from one value creation process into inputs for other production systems (e.g., Florin et al., 2015; Guldmann, 2016; Jukka-Pekka et al., 2016; Lacy et al., 2014; Planing, 2018). Beside these primarily object-related activities and offerings that focus on processing and selling recycled materials and products, managing take-back-logistic-systems, connecting actors within value creation business networks or educating consumers, and the ensuing value propositions, are rather immaterial by providing consultation, elucidation and networking services that implicitly contribute to capture the value from "waste" or byproducts (e.g., Antikainen and Valkokari, 2016; Antikainen et al., 2017a, b; Lewandowski, 2016). Ultimately, the modes of value creation and offerings connect post-use and process waste with production that results in a closed flow of resources (Stahel and Reday-Mulvey, 1981). As Bocken et al. (2016: 314) highlight, they are "focused on exploiting the residual value of resources, potentially making the product more appealing to certain customers … while reducing material costs and the overall product price." Table 2 indicates how scholars conceptualize the modes of value creation and propositions for closing resource loops that companies with CBMs apply.

Slow resource flows. In contrast, the modes of value creation and offerings to slow resource flows aim at prolonging the product life as well as facilitating the reuse of products. They attempt to preserve the inherent value of products and product components by maximizing the number of consecutive use phases and lengthening their use time in each period. It includes the provision of services to fulfill user needs without owning a product as the users receive access to product functions or they make use of performance-

Table 2
Modes of value creation and offerings to close resource loops.

Modes of value creation and offerings to close resource loops	Authors
Modes of value creation	Antikainen and Valkokari (2016); Antikainen et al. (2017); Bocken et al. (2016); EMF, 2013; Franco (2017); Florin et al. (2015); Guldmann (2016); Joustra et al. (2013); Jukka-Pekka et al. (2016); Lüdeke-Freund et al. (2018); Lacy et al. (2014); Lacy and Rutqvist (2015); Lewandowski (2016); Manningen et al. (2018); Moreno et al. (2016); Nuβholz (2017); Planing (2018); Stal and Corvellec (2018); Urbinati et al. (2017).
Downcycling of used materials into materials of lower quality and reduced functionality;	
Upcycling of used materials into materials of higher quality and improved functionality;	
Manufacturing of products and components based on downcycled and upcycled materials;	
Collecting of products, product components, and materials;	
Extracting byproducts;	
Managing take-back-logistic-systems;	
Connecting actors within value creation networks;	
Elucidating/educating	
Offerings	
Downcycled and upcycled materials;	
Products based on downcycled and upcycled materials;	
Byproducts of production processes;	
Solutions for take-back-logistic-systems;	
Solutions for simplifying the collaboration between value creation actors;	
Customer education	

Table 3
Modes of value creation and offerings to slow resource loops.

Modes of value creation and offerings to slow resource loops	Authors
Modes of value creation:	Antikainen and Valkokari (2016); Bocken et al. (2016); Bocken et al. (2018); Bressanelli et al. (2017); Bressanelli et al. (2018); Den Hollander and Bakker, 2016; EMF, 2013; Franco (2017); Florin et al. (2015); Gnoni et al. (2017a); Gnoni et al. (2017b); Guldmann (2016); Heyes et al. (2018); Joustra et al. (2013); Jukka-Pekka et al. (2016); Lüdeke-Freund et al. (2018); Lacy et al. (2014); Lacy and Rutqvist (2015); Lewandowski (2016); Linder and Williander (2015); Manningen et al. (2018); Moreno et al. (2016); Nuβholz (2017); Planing (2018); Roos (2014); Sousa-Zomer et al. (2017a); Sousa-Zomer et al. (2017b); Stal and Corvellec (2018); Urbinati et al. (2017); Whalen et al., (2017) .
Manufacturing of durable products and components;	
Maintaining of products and components;	
Repairing of products and components;	
Refurbishing of products and components;	
Remanufacturing of products and components;	
Upgrading of products and components;	
Collecting of products and components;	
Designing of long-life products and components;	
Reselling of products and components;	
Connecting actors within value creation networks;	
Managing take-back-logistic-systems;	
Elucidating/educating	
Offerings:	
Long-lasting products;	
Repaired products and components;	
Refurbished products and components;	
Remanufactured products and components;	
Used products and product components;	
Upgraded products and product components;	
Access to product functions;	
Performance and results;	
Solutions for take-back-logistic-systems;	
Solutions for simplifying collaboration between value creation actors;	
Customer education	

oriented services (e.g., Bressanelli et al., 2017; EMF, 2013; Guldmann, 2016; Manninen et al., 2018; Sousa-Zomer et al., 2017a). Moreover, designing, manufacturing, and selling durable goods as well as operations and abilities to extend and intensify the product's life such as maintaining, repairing, refurbishing, remanufacturing, upgrading, and reselling slow the resource flow from manufacturing to recycling (e.g., Bocken et al., 2018; Den Hollander and Bakker, 2016; Linder and Williander, 2015; Stal and Corvellec, 2018; Whalen et al., 2017). Consultation such as solutions for take-back-logistic-systems, consumer education through transparency efforts and network services for simplifying the collaboration between value creation actors are primarily non-object-related activities and propositions that indirectly support extending product lifetimes (Bocken et al., 2016; Guldmann, 2016; Jukka-Pekka et al., 2016; Lüdeke-Freund et al., 2018). Table 3 lists the modes of value creation and offerings for slowing resource flows mentioned in the reviewed articles.

4.2.1. Criticism

Are slowing down and growth reconcilable? The main differentiation between closing and slowing resource flows is the time dimension in terms of prolonging product lifetimes. While the modes of value creation and offerings to close resource loops fit well into the century of the "great acceleration" (Steffen et al., 2004), slowing resource flows seems to be irreconcilable. Since the beginning of industrialization, especially in the last 65 years of ceaseless technological progress and permanent economic growth, time saving has become extremely important in the global economy of innovation and novelty (Schumpeter, 1976). Besides cost, quality, and flexibility, time is one of the four main competitive capabilities for a firm to initiate and manage profitable innovation processes (Krajewski et al., 2016). To ensure long-term existence in highly competitive markets, firms must establish more efficient organizational structures, while shortening innovation cycles and reducing time-to-market (TTM). Although there are few, but often-cited case examples of companies that successfully integrate offerings like selling long-lasting products with repair-services (e.g., Miele, Rolex, or Patagonia); reselling used, repaired, refurbished, and remanufactured products (e.g., Arrow Value Recovery or Interface); or providing access and/or performance- and results-based solutions (e.g., Xerox or Philips), they tend to be premium and luxury brands, niche players, or companies that implement BMs to slow resource flows down to improve their reputation and image while ensuring a long existence and competitiveness with linear BMs targeted for growth (e.g., H&M's clothing return initiatives or automobile manufacturers' car sharing initiatives). As Merli et al. (2018) mention, slow approaches that actively seek to prolong product utilization time and intensify product usage (slow fashion, slow electronics, etc.) to reduce the absolute (system-wide) negative impact on nature, require a more profound change in consumption and production patterns. They do not seem coherent in an economy based on growth, acceleration, and consumerism in which fast approaches (fast fashion, fast food, fast electronics, etc.) dominate economic logic and lifestyles. Here, we must question whether the proposed main objective of CBMs to "decouple economic growth from natural resource consumption" is compatible with the modes of value creation and offerings to slow resource loops.

4.3. Core principles of integration – how should it be done?

The next section introduces the most discussed core principles to integrate CBMs into daily practice; or, in other words, which concrete operations can support the implementation of CBMs. Reorganizing producer-consumer relationships; applying new technologies, especially of digital ones; involving relevant stakeholders in the CBM design process; and collaborating within value creation business networks are frequently mentioned conditions for the development and successful realization of CBMs (Table 4).

Stewardship role. Among others, Linder and Williander (2015), Planing (2018), Michelini et al. (2017), and Urbinati et al. (2017) point out that moving from linear BMs to CBMs changes the relationship and product ownership conditions among suppliers and customers. Most of the companies cited in the reviewed articles (e.g., Gnoni et al., 2017b; Guldman, 2016; Heyes et al., 2018; Michelini et al., 2017; Sousa-Zomer et al., 2017b) that applied a case study approach assume a stewardship role by shifting from selling physical products to providing service solutions. Thus, they are deeply involved in the product use phase and generate revenues mainly by providing services that fulfill customers' needs. Bressanelli et al. (2017) argue that manufacturers and service providers who adopt a stewardship role value products, product components, and natural resources as capital assets rather than consumables. Accordingly, they design products for durability, reliability, upgradability, maintenance, or reparability to increase resource productivity and to minimize waste. The paradigm shift from sales-oriented to functions- and solutions-oriented BMs is often associated with the provision of integrated PSSs (e.g., Bressanelli et al., 2017; Gnoni et al., 2017b; Lewandowski, 2016; Michelini et al., 2017; Nuβholz, 2017; Sousa-Zomer et al., 2017a). They can be defined as "tangible products and intangible services designed and combined so that they jointly are capable of fulfilling specific customer needs" (Tukker, 2015: 246). PSSs are categorized

Table 4
Core principles of CBM integration.

Core principles of integration	Authors
Stewardship role Provide PSSs and apply reverse-logistic-systems.	Bocken et al. (2018); Bressanelli et al. (2017); Bressanelli et al. (2018); Den Hollander and Bakker, 2016; Gnoni et al. (2017a); Gnoni et al. (2017b); Guldmann (2016); Florin et al. (2015); Heyes et al. (2018); Joustra et al. (2013); Lewandowski (2016); Linder and Williander (2015); Manninen et al. (2018); Michelini et al. (2017); Nuβholz (2017); Planing (2018); Roos (2014); Sousa-Zomer et al. (2017a); Sousa-Zomer et al. (2017b); Stal and Corvellec (2018); Urbinati et al. (2017); Vogtlander et al. (2017); Witjes and Lozano (2016) .
Adoption of new technologies Convert autonomous products into smart and connected ones.	Antikainen et al. (2017a); Bressanelli et al. (2018); EMF, 2013; Franco (2017); Heyes et al. (2018); Jukka-Pekka et al. (2016); Lacy et al. (2014); Lewandowski (2016); Rubel et al. (2018); Sousa-Zomer et al. (2017); Stal and Corvellec (2018); Urbinati et al. (2017); Witjes and Lozanoa (2016).
Stakeholder involvement Proactive management of the CBM environment, build up and maintain flourished financial- and non-financial-based relationships and promotion of shared values.	Antikainen and Valkokari (2016); Antikainen et al. (2017a); Antikainen et al. (2017b); Bocken et al. (2018); Joustra et al. (2013); Lewandowski (2016); Lüdeke-Freund et al. (2018); Manninen et al. (2018); Rubel et al. (2018); Sousa-Zomer et al. (2017b); Stal and Corvellec (2018); Witjes and Lozano (2016).
Collaboration within value creation business networks Development of new business networks of collaborative production and consumption.	Antikainen and Valkokari (2016); Antikainen et al. (2017a); Antkainen et al. (2017b); Bocken et al. (2016); Bocken et al. (2018); Franco (2017); Lewandowski (2016); Linder and Williander (2015); Lüdeke-Freund et al. (2018); Nuβholz (2017); Manninen et al. (2018); Rizos et al. (2016); Rubel et al. (2018); Schulte (2013); Sousa-Zomer et al. (2017a); Sousa-Zomer et al. (2017b); Stal and Corvellec (2018); Whalen et al. (2017); Urbinati et al. (2017); Witjes and Lozano (2016); Velte and Steinhilper (2016).

in product-oriented services (sales of products added with after-sales services), use-oriented services (the provider maintains ownership of the product while the product is available for different uses), and result-oriented services (focus on performance with no pre-determined product), which aim to both close and slow resource flows. In the reviewed literature, PSSs are closely related to the establishment of reverse logistic systems (e.g., Lewandowski, 2016; Linder and Williander, 2015; Lüdeke-Freund et al., 2018; Nuβholz, 2017). They ensure the return flow of products back to the distributer or manufacturer to recapture the product's remaining inherent value. Therefore, PSSs combined with take-back-logistic-systems enable various types of collaborative product use, with the expectation of dematerializing production and consumption patterns.

Adoption of new technologies. A further debated basic assumption for firms to integrate CBMs is the application of digital technologies. The Internet of Things (IoT), big data analytics, 3D Printing, and so on, offer firms powerful options to make the shift toward CBMs possible. Bressanelli et al. (2018), the EMF (2013), Franco (2017), Heyes et al. (2018), Jukka-Pekka et al. (2016), and Witjes and Lozano (2016) stress that digital technologies convert autonomous products into smart and connected ones to ensure the implementation of PSSs and take-back-logistics. When physical products become smart through sensors and tracking systems (via RFID or other identification technologies), firms can generate real-time information to centrally monitor and manage them. Companies get access to the product conditions, location, use intensity, and availability, and can thus optimize and improve the performance of products and processes by applying big data analytics. Firms can thus obtain knowledge on customer behavior, understand their habits better, and facilitate a more efficient collaboration between the manufacturer, service provider, logistician, and customer.

Stakeholder involvement. To design and establish a viable CBM, companies require active reciprocal interactions between them and all actors that participate in the value creation business network and all other stakeholders that are not directly involved in the value creation architecture. The long-term existence of CBMs can only be guaranteed when companies fulfill the needs of all stakeholder groups from the technological, legal, political, cultural, and economic sphere (Antikainen and Valkokari, 2016; Bocken et al., 2018; Manninen et al., 2018; Sousa-Zomer et al., 2017b; Witjes and Lozano, 2016). They provide firms with the tangible and intangible resources necessary for the value creation processes, and they are in turn affected by the CBM's activities. Companies obtain the stakeholders' license to operate as long as there is a balance between the perceived costs and benefits; otherwise, they lose their social legitimacy (Freeman and McVea, 2001). Therefore, beside market-based value exchange mechanisms, non-financial transactions are also essential to implement a CBM successfully. Stakeholder involvement requires proactive management of the CBM environment, flourishing financial- and non-financial-based relationships, and the promotion of shared values (Rüegg-Stürm and Grand, 2016).

Collaboration within value creation business networks. The conversion from linear to circular business infrastructures requires that firms develop new business networks of collaborative production and consumption that help them implement the modes of circular value creation and offerings. Authors such as Antikainen et al. (2017a), Antikainen et al. (2017b), Bocken et al. (2018), Franco (2017), Rizos et al. (2016), Rubel et al. (2018), and Whalen et al. (2017) show the importance of communication, engagement, and cooperation between the circular value network actors to understand where and how value is created. Consequently, the individual BMs of the participating manufacturers, service providers, retailers, logisticians, and so on must be compatible, interlinked, and harmonized. Close relationships and channel control seem necessary to ensure sufficient volumes of products and materials, both upstream and downstream, in the value circle. This relates not only to the supply of used product components or down- and upcycled materials, but also to provide used, repaired, and reprocessed products and components (Linder and Williander, 2015; Velte and Steinhilper, 2016; Whalen et al., 2017).

4.3.1. Criticism

The fallacy of PSSs. Bocken et al. (2016), Bocken et al. (2018), Lüdeke-Freund et al. (2018), Manninen et al. (2018), and Michelini et al. (2017) remark, with reference to Mont (2002, 2004) and Tukker (2004, 2015), that in theory result-oriented PSSs show the greatest potential to contribute to an absolute reduction in natural resource consumption (e.g., energy performance contracting or light as service). Product-oriented PSSs do not change the classic incentives to maximize product sales but they could comprise practices such as maintaining or repairing services, which might lead to the preservation of natural resources. Nevertheless, rising product sales could (over-)compensate the savings in energy and material. Use-oriented PSSs characterized by product leasing, renting, sharing, and pooling can lead to less careful use of the product as there is no emotional attachment between the user and artifact, probably leading to higher environmental impacts. Moreover, they can "trigger consumers to spend their savings on other polluting activities (e.g., flights …)" (Bocken et al., 2016: 315) or other consumables (Lüdeke-Freund et al., 2018; Zink and Geyer, 2017). As discussed above, there is the potential for direct and/or indirect systemic rebound effects.

Complexity and resilience are diametrically opposed. Most of the literature argues that proactive cooperation between the business network actors through coordinated BM innovations is essential to close product and material loops. However, most sectors and industries, such as textile, electronics, food, or mobility, have global, highly fragmented, and dispersed supply chains. Franco (2017), Linder and Williander (2015), Rizos et al. (2016), Stal and Corvellec (2018), and Velte and Steinhilper (2016) claim that managing the reorganization from supply chains to value circles requires the removal of information asymmetries and the development of economically viable reverse-logistic-systems, technical and organizational solutions to handle the unpredictable return flow of products and materials, and trust within the business networks. This tends to increase transaction costs massively and the perceived uncertainty and vulnerability among the actors involved (Rizos et al., 2016; Velte and Steinhilper, 2016). This can be seen to contradict the often-quoted main objective of CBMs to decrease dependence on international commodity markets, though firms may become more fragile in other business contexts simultaneously. The reviewed articles do not provide suggestions to overcome this shortcoming and contradiction or discuss how the rising complexity of managing collaboration in global, highly-fragmented value creation business networks in CBM conceptualizations.

5. Discussion and conclusion

New, disruptive CBMs aim to restructure existing markets by prolonging the value of products and materials to reduce the usage of primary raw materials and create positive impacts on society and the natural environment. In the previous section, the "reference frame of circular business model conceptions" was introduced highlighting the relevance of PSSs, digital technologies, stakeholder involvement, and collaboration within business networks to speed up the diffusion of circular value creation architectures, and thus

the transition toward resilient businesses stabilized in a green growth economy. Most authors assume that the CBM configurations above contribute to a more holistic and radical change compared to strategies that achieve incremental resource efficiency improvements. However, how holistic and radical are CBMs theoretically constituted if we examine the words "holistic" and "radical" according to their etymological foundations and origins?

We can describe the contemporary overall theoretical framing of CBMs as ambivalent and divergent when we ask whether CBMs function as catalysts for an economic transition toward sustainability. CBM conceptions are mostly far from holistic and radical, as they fail to address the roots of the persistent problems it aims to solve. Researchers primarily pursue an ecological modernist position that technical solutions can create a new efficiency revolution to decouple economic expansion from ecological burdens (e.g., Bressanelli et al., 2018; EMF, 2013; Lacy et al., 2014; Lacy and Rutqvist, 2015; Moreno et al., 2016; Planing, 2018; Rubel et al., 2018; Schulte, 2013; Urbinati et al., 2017). In particular, when digital and smart products control, steer, and thus change consumers' behavior, the authors assume a technocratic perspective of change. The declaration of IOT, RFID, and other digital applications as a lever for implementing CBMs harmonizes well with the green growth imperative, the integration of product-oriented and use-oriented PSSs, as well as the modes of value creation and offerings to close resource loops. It strengthens the dominant business paradigm that strives to overcome resource scarcity and environmental crises without diverging from financial ratios. Interpreted in this way, CBMs are just another green-coated business approach that reinforces neo-liberalism through its orientation toward shareholder value, which is subject to the contemporary business rationale that "the social responsibility of business is to increase profits" (Friedman, 1970: 1). Consequently, most CBM conceptualizations resemble an incremental rather than a fundamental change in the business logics that represent the weak sustainability approach. The majority of studies examined do not address the risk of system-wide rebound effects through growth efforts and issues of social exploitation in the current value creation networks. Even if business patterns like recycling waste into new forms of value and sharing approaches such as use-oriented PSSs are crucial for restructuring consumption and production systems, greater efforts are needed to accelerate the transition toward a society that flourishes within planetary boundaries (O'Neill et al., 2018; Steffen et al., 2015). CBM conceptions must go beyond efficiency and consistency strategies, as Zink and Geyer (2017: 600) point out: "What is truly required to reduce environmental impact is less production and less consumption."

This leads to another interpretation of CBMs. A few authors construct CBMs more pluralistically by highlighting the potential risk of systemic negative feedback loops (Bocken et al., 2016, 2018; Lüdeke-Freund et al., 2018; Manninen et al., 2018; Michelini et al., 2017; Nuβholz, 2017), combining CBMs with the stakeholder value concept (e.g., Antikainen and Valkokari, 2016; Antikainen et al., 2017a; Bocken et al., 2018; Joustra et al., 2013; Lewandowski, 2016; Manninen et al., 2018; Sousa-Zomer et al., 2017b; Stal and Corvellec, 2018), and discuss BMs for sufficiency in more detail (Bocken et al., 2016). At this point, the CBM concept currently overlaps with post-growth debates at the micro level (Hobson and Lynch, 2016; Jackson, 2009; Reichel, 2016; Raworth, 2012). In this reading, CBMs can help accelerate the sustainability transition to an economy that adopts an agnostic attitude to economic growth by providing solutions that proactively seek to reduce overall end-user consumption. For this, the field requires more transdisciplinary research to explore CBMs that pursue modes of value creation and offerings to slow resource flows down, especially those that experiment with result-oriented PSSs or non-consumerist business configurations (slow fashion, slow electronics, etc.). Given the obvious uncertainties and financial risks to experiment with these forms of value creation systems in an economic environment characterized by acceleration and fast consumerism, corporations need long-term reflection and innovation partnerships with stakeholder groups from different spheres of society, especially with research institutions. The co-production of knowledge, options for action, and development perspectives through the interaction of actors from academics and business encourages mutual learning processes that contribute to evolve transition capabilities in a world that apparently becomes increasingly complex. To explore the development and diffusion of CBM innovations for slowing down resource flows, time and spaces are necessary to cooperate, learn, and experiment; to discuss heterogeneous perspectives and practices in constructive dialogue formats in order to integrate theoretical and practical knowledge into reliable change approaches for new unproven paths (Rüegg-Stürm and Grand, 2016). It is the responsibility of politics, academics, and businesses to create such interaction arenas and experimental spaces. For example, future CBM research has to address the challenges of estimating the environmental impacts of CBMs at the system level. As Manninen et al. (2018) point out, scientific work should focus on developing environmental assessment metrics for corporations implementing new CBMs.

Another key insight from the systematic literature review is that CBM debates must include questions of how to handle the sharply rising complexity, and hence transaction costs, associated with close collaboration in globally fragmented and dispersed value creation networks (Franco, 2017; Linder and Williander, 2015; Rizos et al., 2016; Stal and Corvellec, 2018; Velte and Steinhilper, 2016). It seems almost impossible to reconfigure the current highly complex and globalized value chains. Shortening and downsizing value circles by regionalizing the value creation and delivery infrastructures is one gradual strategy to diminish complexity. Thus, it is more practical to implement CBMs at the local or regional level by applying decentralization strategies to reduce complexity and vulnerability while developing organizational capabilities such as flexibility, agility, or a high degree of adaptability to anticipate trends in changing market environments. Integrating the principle "think global – act local" into the CBM conceptions raises business resilience to the next level. Regionalized circular business networks are not only manageable by keeping transaction costs to a minimum, but they also have positive effects beyond the business network boundaries by strengthening social cohesion, creating a sense of community spirit, and rebuilding trust among citizens in economic processes and structures (Raworth, 2012). This can be summarized in the movement of appropriate technology, where decentralized, small-scale, energy-efficient, people-centered, and locally autonomous solutions have a lower impact on the environment than do large-scale global solutions (Murray et al., 2017; Schumacher, 1973). In this light, the field requires future research to clarify how to manage and control rising complexity in the establishment of circular business networks, and which consequences arise for each actor in these business networks. Firms need new tools to manage this complexity. Such tools should integrate business network system dynamics change in terms of scale and time to reduce information asymmetries and uncertainty. In addition, future scientific work should address issues on how transnational corporations can reorganize their globally aligned business infrastructures toward decentralized, local, and autonomous, but interconnected, value creation entities.

Although some authors explicitly recognize stakeholder involvement as a core principle of CBM integration, the social aspects of CBM conceptualizations are virtually absent. To become a business approach that drives sustainability transitions, CBM

conceptions must be more diverse and pluralistic in design. Transparency in value creation networks, a more equitable distribution of earnings and assets (in particular in the context of the north-south perspective), or the redistribution of power (e.g., through open standards, open knowledge, or open design) are essential moral issues that are missing in the overall CBM framing. Only if research includes explicitly aspects of social justice in the theoretical foundations of CBMs it is appropriate to label the concept as sustainable. This needs urgent attention in the further conceptual development of CBMs and should be considered in future research.

The "reference frame for circular business model conceptions" presented in this study contributes to the field by extending the academic discussion of CBMs. Thus, it helps to clarify the notion of sustainability and the normative settings as well as operational arrangements of CBM conceptions in the scientific literature and debates the existing inconsistencies. The academic literature is still only beginning the discovery process, but it would benefit from a greater engagement with more "radical" sustainable BM innovation approaches than those that underpin the current understanding and visions of CBMs. This study provides instructive recommendations: first, to abolish the constraints related to the current logics of CBMs; and second, to diversify future research on CBMs.

Conflicts in interest

The author declares no conflict of interest. The founding sponsors had no role in the study design; collection, analyses, or interpretation of data; writing of the manuscript, and decision to publish the results.

Acknowledgments

This research is supported and funded by Heinrich Böll Stiftung – The Green Political Foundation, Germany. I would like to thank Dodo zu Knyphausen-Aufseß and three anonymous reviewers for their constructive comments on this research. Furthermore, I am a participant of the interdisciplinary researcher group "Obsolescence as a challenge for sustainability" which is funded from July 2016 to June 2021 by the German Federal Ministry of Education and Research in the frame of the Research for Sustainability program. Special thanks to the group members for the inspiring exchange of ideas and thoughts.

References

Amit, R., Zott, C., 2001. Value creation in E-business. Strat. Manag. J. 22, 493–520. https://doi.org/10.1002/smj.187.

Antikainen, M., Valkokari, K., 2016. A framework for sustainable circular business model innovation. Tech. Inno. Man. Rev. 6 (7), 5–12.

Antikainen, M., Aminoff, A., Kettunen, O., Sundqvist-Andberg, H., Paloheimo, H., 2017a. Circular Economy business model innovation process-case study. Int. Conf. Sustain. Des. Manuf. 2017, 546–555. https://doi.org/10.1007/978-3-319-57078-5_52.

Antikainen, M., Aminoff, A., Paloheimo, H., Kettunen, O., 2017b. Designing circular business model experimentation – case Study. In: The ISPIM Innovation Forum 2017, Toronto, Canada, 19-22 March.

Ayres, R.U., 1994. Industrial metabolism; theory and policy. In: Allenby, B.R., Richards, D.J. (Eds.), The Greening of Industrial Ecosystems. National Academy Press, Washington, DC, pp. 23–37.

Bastein, T., Roelofs, E., Rietveld, E., Hoogendoorn, A., 2013. Opportunities for a Circular Economy in the netherlands. Available: https://www.government.nl/documents/reports/2013/10/04/opportunities-for-a-circular-economy-in-the-netherlands. (Accessed 8 May 2018).

Bates, K., Bates, H., Johnston, R., 2003. Linking service to profit: the business case for service excellence. Int. J. Serv. Ind. Manag. 14 (2), 173–183. https://doi.org/10.1108/09564230310474147.

Benyus, J., 2002. Biomimicry: Innovation Inspired by Design, first ed. Harper Perennial, New York.

Bidmon, C.M., Knab, S.,F., 2017. The three roles of business models in societal transitions: new linkages between business model and transition research. J. Clean. Prod. 178, 903–916. https://doi.org/10.1016/j.jclepro.2017.12.198.

Bleicher, K., 1994. Integrative management in a time of transformation. Long. Range Plan. 27 (5), 136–144. https://doi.org/10.1016/0024-6301(94)90234-8.

BMUB (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety), 2016. Deutsches Ressourceneffizienzprogramm II: Programm zur nachhaltigen Nutzung und zum Schutz der natürlichen Ressourcen. Available: http://www.bmu.de/fileadmin/Daten_BMU/Pools/Broschueren/progress_ii_broschuere_bf.pdf. (Accessed 8 May 2018).

Bocken, N.M.P., Short, S., 2016. Towards a sufficiency-driven business model: experiences and opportunities. Environ. Inn. A. Soc. Trans. 18, 41–61. https://doi.org/10.1016/j.eist.2015.07.010.

Bocken, N.M.P., Short, S., Rana, P., Evans, S., 2013. A value mapping tool for sustainable business modelling. Intern. J. Busi. Soc. 13 (5), 482–497. https://doi.org/10.1108/CG-06-2013-0078.

Bocken, N.M.P., Short, S., Rana, P., Evans, S., 2014. A literature and practice review to develop sustainable business model archetypes. J. Clean. Prod. 65, 42–56. https://doi.org/10.1016/j.jclepro.2013.11.039.

Bocken, N.M.P., Bakker, C., Pauw, I. De, 2016. Product design and business model strategies for a circular economy. J. Ind. Prod. Eng. 33, 308–320. https://doi.org/10.1080/21681015.2016.1172124.

Bocken, N.M.P., Schuit, C.S.C., Kraaijenhagen, C., 2018. Experimenting with a circular business model: lessons from eight cases. Envir. Inno. A. Soc. Trans. Article (in press) https://doi.org/10.1016/j.eist.2018.02.001.

Boulding, K.E., 1966. The economics of the coming spaceship earth. In: Jarrett, H. (Ed.), Environmental Quality in a Growing Economy. MD. Resources for the Future/Johns Hopkins University Press, Baltimore, pp. 3–14.

Bressanelli, G., Perona, M., Saccani, N., 2017. Reshaping the washing machine industry through circular economy and product-service system business models. In: The 9th CIRP IPSS Conference: Circular Perspectives on Product/Service-Systems 2017, pp. 43–48. https://doi.org/10.1016/j.procir.2017.03.065.

Bressanelli, G., Adrodegari, F., Perona, M., Saccani, N., 2018. Exploring how usage-focused business models enable circular economy through digital technologies. Sustain. Times 10 (639), 1–21. https://doi.org/10.3390/su10030639.

Breuer, H., Lüdeke-Freund, F., 2017. Values-based network and business model innovation. Int. J. Innov. Manag. 21 (3), 1–35. https://doi.org/10.1142/S1363919617500281.

Chesbrough, H.W., 2010. Business model innovation: opportunities and barriers. Long. Range Plan. 43, 354–363. https://doi.org/10.1016/j.lrp.2009.07.010.

Den Hollander, M., Bakker, C., 2016. Mind the gap exploiter: circular business models for product lifetime extension. In: Electronics Goes Green Conference 2016, Berlin, Germany, 6-9 September.

Denyer, D., Tranfield, D., 2009. Producing a systemic review. In: Buchanan, D., Bryman, A. (Eds.), The Sage Handbook of Organizational Research Methods. Paperbackshop, London, pp. 671–689.

EAJ (Environmental Agency of Japan), 2013. Fundamental Plan for Establishing a Sound Material-Cycle Society. Available: http://www.env.go.jp/en/focus/docs/files/20131018-79.pdf. (Accessed 9 May 2018).

EC (European Commission), 2016. Towards a circular economy. Available: https://ec.europa.eu/commission/priorities/jobs-growth-and-investment/towards-circular-economy_en. (Accessed 9 May 2018).

Elo, S., K, H., 2007. The qualitative content analysis process. J. Adv. Nurs. 62 (1), 107–115. https://doi.org/10.1111/j.1365-2648.2007.04569.x.

EMF (Ellen MacArthur Foundation), 2013. Towards the circular economy: economic and business rationale for an accelerated transition. Available: https://ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf. (Accessed 7 May 2018), 1.

EMF (Ellen MacArthur Foundation), 2018. Member groups. Available: https://www.ellenmacarthurfoundation.org/ce100/member-groups/corporates. (Accessed 10 May 2018).

Florin, N., Madden, B., Sharpe, S., Benn, S., Agarwal, R., Perey, R., Giurco, D., 2015. Shifting business models for a circular economy: metals management for multi-product-use cycles. Available: http://wealthfromwaste.net/wp-content/uploads/2015/11/P3-FINAL-SHIFTING-BUSINESS-MODELS-FOR-CE-ONLINE.pdf. (Accessed 30 June 2018).

Franco, M., 2017. Circular economy at the micro level: a dynamic view of incumbents' struggles and challenges in the textile industry. J. Clean. Prod. 168, 833–845. https://doi.org/10.1016/j.jclepro.2017.09.056.

Freeman, R.,E., McVea, J.,A., 2001. Stakeholder approach to strategic management. Darden Business School Working Paper 1–32. No. 01-02, Available at SSRN: https://ssrn.com/abstract=263511 https://dx.doi.org/10.2139/ssrn.263511.

Friedman, M., 1970. The social responsibility of business is to increase its profits. Available: http://www.umich.edu/~thecore/doc/Friedman.pdf. (Accessed 30 June 2018).

Geissdoerfer, M., et al., 2017. The circular economy – a new sustainability paradigm. J. Clean. Prod. 143, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048.

Ghisellini, P., Cialani, C., Ulgiati, S., 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. J. Clean. Prod. 114, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007.

Gnoni, M.G., Mossa, G., Mummolo, G., Tornese, F., Verriello, R., 2017a. Circular economy strategies for electric and electronic equipment: a fuzzy cognitive map. Envir. Eng. A. Mana. J. 16 (8), 1807–1817.

Gnoni, M.G., Mossa, G., Mummolo, G., Tornese, F., Verriello, R., 2017b. Supporting circular economy through use-based business models: the washing machines

case. In: The 9th CIRP IPSS Conference: Circular Perspectives on Product/Service-Systems 2017, pp. 49–54. https://doi.org/10.1016/j.procir.2017.03.018.
Graedel, T.E., Allenby, B.R., 1995. Industrial Ecology, first ed. Prentice Hall, Englewood Cliffs, N.J.
Grin, J., Rotmans, J., Schot, J., 2010. Transitions to Sustainable Development: New Directions in the Study of Long Term Trans- Formative Change, first ed. Routledge, New York/Oxford.
Guldman, E., 2016. Best Practice Examples of Circular Business Models. Available: https://www2.mst.dk/Udgiv/publications/2016/06/978-87-93435-86-5.pdf. (Accessed 30 June 2018).
Heyes, G., Sharmina, M., Mendoza, J.M.F., Gallego-Schmid, A., Azapagic, A., 2018. Developing and implementing circular economy business models in service-oriented technology companies. J. Clean. Prod. 177, 621–632. https://doi.org/10.1016/j.jclepro.2017.12.168.
Hirsch Hadorn, G., Bradley, D., Pohl, C., Rist, S., Wiesmann, U., 2005. Implications of transdisciplinarity for sustainability research. Ecol. Econ. 60, 119–128. https://doi.org/10.1016/j.ecolecon.2005.12.002.
Hobson, K., Lynch, N., 2016. Diversifying and de-growing the circular economy: radical social transformation in a resource-scarce world. Futures 82, 15–25.
Homrich, A.S., Galvao, G., Abadia, L.G., Carvalho, M.M., 2018. The circular economy umbrella: trends and gaps on integrating pathways. J. Clean. Prod. 175, 525–543. https://doi.org/10.1016/j.jclepro.2017.11.064.
IPCC (Intergovernmental Panel on Climate Change), 2014. Climate Change 2014 - Mitigation of Climate Change. Available: https://ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_full.pdf. (Accessed 6 May 2018).
ISDRI (Institute for Sustainable Development and International Relations), SDSN (Sustainable Development Solutions Network), 2015. Pathways to deep decarbonization. http://deepdecarbonization.org/wp-content/uploads/2016/03/DDPP_2015_REPORT.pdf. (Accessed 6 May 2018).
Jackson, T., 2009. Prosperity without Growth: Economics for a Finite Planet, first ed. (Earthscan, Sterling).
Jahn, T., 2015. Theory of sustainability? Considerations on a basic understanding of "sustainability science". In: Enders, J.,C., Remig, M. (Eds.), Theories of Sustainable Development. Routledge studies in sustainable development, London and New York, pp. 30–42.
Jesson, J., Lacey, F., 2006. How to do (or not to do) a critical literature review. Pharm. Educ. 6 (2), 139–148. https://doi.org/10.1080/15602210600616218.
Johnson, M.W., Christensen, C.M., Kagermann, H., 2008. Reinventing your business model. Harv. Bus. Rev. 86, 50–59. Available: https://hbr.org/2008/12/reinventing-your-business-model. (Accessed 11 May 2018).
Joustra, D.J., de Jong, E., Engelaar, F., 2013. Guided choices towards a circular business model. Available: https://de.scribd.com/document/210493256/Guided-Choices-Towards-a-Circular-Business-Model-PDF. (Accessed 30 June 2017).
Jukka-Pekka, O., Poutiainen, P., Sorasahi, H., Aho, M., Annala, J., L, j.M., 2016. Business Models for a Circular Economy: 7 Companies Paving the Way. Available: https://www2.mst.dk/Udgiv/publications/2016/06/978-87-93435-86-5.pdf. (Accessed 30 June 2018).
Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy: an analysis of 114 definitions. Resour. Conserv. Recycl. 127, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005.
Korhonen, J., Honkasalo, A., Seppälä, J., 2018. Circular economy: the concept and its limitations. Indu. Ecol. 143, 37–46. https://doi.org/10.1016/j.ecolecon.2017.06.041.
Krajewski, L.,J., Malhotra, M.,K., Ritzman, L.,P., 2016. Operations Management. Processes and Supply Chains, vol. 11. Pearson, Boston.
Lacy, P., Rutqvist, J., 2015. Waste to Wealth. Palgrave and Macmillan, Basingstoke, Hampshire.
Lacy, P., Keeble, J., McNamara, R., Rutquvist, J., Eckerle, K., Haglund, T., Buddemeier, P., Cui, M., Sharma, A., Cooper, A., Senior, T., Petterson, C., 2014. Circular Advantage: Innovative Business Models and Technologies to Create Value in a World without Limits to Growth. Available: https://www.accenture.com/t20150523T053139__w__/us-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Strategy_6/Accenture-Circular-Advantage-Innovative-Business-Models-Technologies-Value-Growth.pdf. (Accessed 30 June 2018).
Leach, M., Raworth, K., Rockström, J., 2013. Between social and planetary boundaries: navigating pathways in the safe and just space for humanity. In: ISSC (International Social Science Council)/UNESCO (United Nations Educational, Scientific and Cultural Organization. World Social Science Report 2013: Changing Global Environments. OECD Publishing and Unesco Publishing, pp. 84–89. https://doi.org/10.1787/9789264203419-10-en.
Lepawsky, J., Mather, C., 2011. From beginnings and endings to boundaries and edges: rethinking circulation and exchange through electronic waste. Royal Geo. Society 43 (3), 242–249. https://doi.org/10.1111/j.1475-4762.2011.01018.x.
Lewandowski, M., 2016. Designing the business models for circular economy towards the conceptual framework. Sustain. Times 8 (43), 1–28. https://doi.org/10.3390/su8010043.
Lieder, M., Rashid, A., 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry. J. Clean. Prod. 115, 36–51. https://doi.org/10.1016/j.jclepro.2015.12.042.
Linder, M., Williander, M., 2015. Circular business model innovation: inherent uncertainties. Bus. Strateg. Environ. 26, 182–196. https://doi.org/10.1002/bse.1906.
Loorbach, D., Wijsman, K., 2013. Business transition management: exploring a new role for business in sustainability transitions. J. Clean. Prod. 45, 20–28. https://doi.org/10.1016/j.jclepro.2012.11.002.
Lovins, A.B., Lovins, L.H., Hawken, P., 1999. Natural Capitalism: the Next Industrial Revolution, first ed. Earthscan, London.
Lüdeke-Freund, F., Massa, L., Bocken, N.M.P., Brent, A., Musango, J., 2016. Business models for shared value. Available: https://nbs.net/p/main-report-business-models-for-shared-value-4122f859-2499-4439-824e-7535631a14ed. (Accessed 11 May 2018).
Lüdeke-Freund, F., Gold, S., Bocken, N.M.P., 2018. A review and typology of circular economy business model patterns. J. Ind. Ecol. (in press) https://doi.org/10.1111/jiec.12763.
Magretta, J., 2002. Why business models matter. Harv. Bus. Rev. 80, 86–92. Available: https://hbr.org/2002/05/why-business-models-matter. (Accessed 11 May 2018).
Manninen, K., Koskela, S., Antikainen, R., Bocken, N.M.P., Dahlbo, H., Aminoff, A., 2018. Do circular economy business models capture intended environmental value propositions? J. Clean. Prod. 171, 413–422.
Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: an emerging field of research and its prospects. Res. Pol. 41, 955–967. https://doi.org/10.1016/j.respol.2012.02.013.
Massa, L., Tucci, C.L., Afuah, A., 2017. A critical assessment of business model research. Acad. Manag. Ann. 11, 73–104. https://doi.org/10.5465/annals.2014.0072.
Mayring, P., 2000. Qualitative content analysis. Forum Qualitative Sozialforschung/Forum Qual. Soc. Res. 1 (2). Art. 20. http://nbn-resolving.de/urn:nbn:de:0114-fqs0002204.
Mayring, P., 2015. Qualitative Inhaltsanalyse. Grundlagen und Techniken, 12. Beltz, Weinheim und Basel.
McDonough, W., Braungart, M., 2002. Cradle to Cradle: Remaking the Way We Make Things, first ed. North Point Press, New York.
Merli, R., Preziosi, M., Acampora, A., 2018. How do scholars approach the circular economy? A systematic literature review. J. Clean. Prod. 178, 703–722. https://doi.org/10.1016/j.jclepro.2017.12.112.
Michelini, G., Moraes, R.N., Cunha, R.N., Costa, J.M.H., Ometto, A.R., 2017. From linear to circular economy: PSS conducting the transition. In: The 9th CIRP IPSS Conference: Circular Perspectives on Product/Service-Systems (2017), pp. 2–6.
Mont, O.,K., 2002. Clarifying the concept of product-service system. J. Clean. Prod. 10, 237–245. https://doi.org/10.1016/S0959-6526(01)00039-7.
Mont, O.,K., 2004. Product-service Systems: Panacea or Myth? IIIEE. Lund University, Lund. Available: https://lup.lub.lu.se/search/publication/467248. (Accessed 16 October 2018).
Moreau, V., Sahakian, M., van Griethuysen, P., Vuille, F., 2017. Coming full circle: why social and institutional dimensions matter for the circular economy. J. Ind. Ecol. 21, 497–506. https://doi.org/10.1111/jiec.12598.
Moreno, M., De los Rios, C., Rowe, Z., Charnley, F., 2016. A conceptual framework for circular design. Sustain. Times 8 (937), 1–15. https://doi.org/10.3390/su8090937.
Murray, A., Skene, K., Haynes, K., 2017. The circular economy: an interdisciplinary exploration of the concept and application in a global context. J. Bus. Ethics 140 (3), 369–380. Available: https://link.springer.com/article/10.1007%2Fs10551-015-2693-2. (Accessed 7 May 2018).
Nußholz, J.L.K., 2017. Circular business models: defining a concept and framing an emerging research field. Sustain. Times 9, 1810, 1-16. https://doi.org/10.3390/su9101810.
O'Neill, D.W., Fanning, A.L., Lamb, W.F., Steinberger, J.K., 2018. A good life for all within planetary boundaries. Nat. Sustain. 1, 88–95. https://doi.org/10.1038/s41893-018-0021-4.
Osterwalder, A., Pigneur, Y., 2010. Business Model Generation, first ed. NJ Wiley, Hoboken.
Pauli, G.A., 2010. The Blue Economy: 10 Years, 100 Innovations, 100 Million Jobs, first ed. Paradigm Publications, Taos NM.
Pearce, D.W., Turner, R.K., 1989. Economics of Natural Resources and the Environment. John Hopkis Univerity Press, Balt. https://doi.org/10.2307/1242904.
Planing, P., 2018. Towards a circular economy - how business model innovation will help to make the shift. Intern. J. Bus. a. Global. 20, 71–83. https://doi.org/10.1504/IJBG.2018.088665.
Raworth, K., 2012. A safe and just space for humanity. Available: https://www.oxfam.org/sites/www.oxfam.org/files/dp-a-safe-and-just-space-for-humanity-130212-en.pdf. (Accessed 7 May 2018).
Reichel, A., 2016. What's Next? Wirtschaften jenseits des Wachstums. In: Horx, M. (Ed.), Zukunftsreport, Zukunftsinstitut, Frankfurt Am Main, pp. 110–135.
Rizos, V., Behrens, A., van der Gaast, W., Hofman, E., Ioannou, A., Kafyeke, T., Flamos, A., Rinaldi, E., Papadelis, S., Hirschnitz-Garbers, M., Topi, G., 2016. Implementation of circular economy business models by small and medium-sized enterprises (SMEs): barriers and enablers. Sustain. Times 8 (1212), 1–18. https://doi.org/10.3390/su8111212.
Rizos, V., Tuokko, K., Behrens, A., 2017. The Circular Economy: a review of definitions, processes and impacts. Available: https://www.ceps.eu/publications/circular-economy-review-definitions-processes-and-impacts. (Accessed 7 May 2018).
Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin III, F.S., Lambin, E., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H., Nykvist, B., De Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sorlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., Foley, J., 2009. Planetary boundaries: exploring the safe operating space for humanity. Ecol. Soc. 14 (2), 1–33. http://www.ecologyandsociety.org/vol14/iss2/art32.

Roos, G., 2014. Business model innovation to create and capture resource value in future circular material chains. Res. 3, 248–274. https://doi.org/10.3390/resources3010248.
Rothenberg, S., 2007. Sustainability through servicing. MIT Sloan Manag. Rev. 48 (2), 83–91. Available: http://greeneconomics.net/Servicizing.pdf. (Accessed 15 February 2019).
Rotmans, J., Loorbach, D., 2009. Complexity and transition management. J. Ind. Ecol. 13, 184–196. https://doi.org/10.1111/j.1530-9290.2009.00116.x.
Rubel, H., Schmidt, M., Meyer zum Felde, A., Mendiluce, M., Brown, A., Edgerton, B., Tylor, J., 2018. The new big circle: achieving growth and business model innovation through circular economy implementation. Available: http://docs.wbcsd.org/2018/01/The_new_big_circle.pdf. (Accessed 30 June 2018).
Rüegg-Stürm, J., Grand, S., 2016. The St. Galler Management Model, first ed. (Haupt, Bern).
Sauvé, S., Bernard, S., Sloan, P., 2016. Environmental sciences: sustainable development and circular economy: alternative concepts for trans-disciplinary research. Environ. Dev. 17, 48–56. https://doi.org/10.1016/j.envdev.2015.09.002.
Sawhney, M., Balasubramanian, S., Krishnan, V.,V., 2004. Creating growth with services. MITSloan Manage. Rev. 45 (2), 34–43. Available: https://sloanreview.mit.edu/article/creating-growth-with-services/. (Accessed 15 February 2019).
Schubert, R., Messner, D., Blasch, J., 2011. About ship! Why we need a "great transformation. GAIA – Ecol. Persp. F. Sci. a. Soc. 20, 243–245. https://doi.org/10.14512/gaia.20.4.7.
Schuitmaker, T.J., 2012. Identifying and unravelling persistent problems. Technol. Forec. A. Soc. Cha. 79, 1021–1031. https://doi.org/10.1016/j.techfore.2011.11.008.
Schulte, U.G., 2013. New business models for a radical change in resource efficiency. Environ. Innov. a. Soc. Trans. 9, 43–47. https://doi.org/10.1016/j.eist.2013.09.006.
Schumacher, E.,F., 1973. Small Is Beautiful: A Study of Economics as if People Mattered. Blond & Briggs, London.
Schumpeter, J.,A., 1934. The Theory of Economic Development. Harvard University Press, Cambridge.
Schumpeter, J.,A., 1976. Capitalism, Socialism and Democracy. George Allen & Unwin, London.
Schwegler, R., 2009. Moralisches Handeln von Unternehmen: Eine Weiterentwicklung des neuen St. Galler Management-Modells und der Ökonomischen Ethik, first ed. Gabler Edition Wissenschaft, 2008.
Smith, A., Stirling, A., Berkhout, F., 2005. The governance of sustainable socio-technical transitions. Res. Pol. 34, 1491–1510. https://doi.org/10.1016/j.respol.2005.07.005.
Sousa-Zomer, T.T., Magalhães, L., Zancul, E., Cauchick-Miguel, P.A., 2017a. Exploring the challenges for circular business implementation in manufacturing companies: an empirical investigation of a pay-per-use service provider. Resour. Conserv. Recycl. Article (in press) https://doi.org/10.1016/j.resconrec.2017.10.033.
Sousa-Zomer, T.T., Magalhães, L., Zancul, E., Cauchick-Miguel, P.A., 2017b. Lifecycle management of product-service systems: a preliminary investigation of a white goods manufacturer. In: The 9th CIRP IPSS Conference: Circular Perspectives on Product/Service-Systems 2017, pp. 31–36. https://doi.org/10.1016/j.procir.2017.03.041.
Stahel, W.R., 2010. The Performance Economy, second ed. Palgrave-MacMillan, London.
Stahel, W.R., Reday-Mulvey, G., 1981. Jobs for Tomorrow: the Potential for Substituting Manpower for Energy, first ed. Vantage Press, New York.
Stal, H.I., Corvellec, H., 2018. A decoupling perspective on circular business model implementation: illustrations from Swedish apparel. J. Clean. Prod. 171, 630–643. https://doi.org/10.1016/j.jclepro.2017.09.249.
Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetzer, I., Bennett, E.M., Biggs, R., 2015. Planetary boundaries: guiding human development on a changing planet. Science 347 (6223), 736–747. http://science.sciencemag.org/lookup/doi/10.1126/science.1259855.
Steffen, W., Sanderson, A., Tyson, P.D., Jäger, J., Matson, P.A., Moore III, B., Oldfield, F., Richardson, K., Schellnhuber, H.J., Turner, B.L., Wasson, R.J., 2004. Global Change and the Earth System: A Planet Under Pressure. Springer-Verlag, Berlin, Heidelberg, New York.
Su, B., Heshmati, A., Geng, Y., Yu, X., 2013. A review of the circular economy in China: moving from rhetoric to implementation. J. Clean. Prod. 42, 215–227. https://doi.org/10.1016/j.jclepro.2012.11.020.
Teece, D.J., 2010. Business models, business strategy and innovation. Long. Range Plan. 43, 172–194. https://doi.org/10.1016/j.lrp.2009.07.003.
Torraco, R., 2005. Writing integrative literature reviews: guidelines and examples. Hum. Resour. Dev. Rev. 4, 356–376. https://doi.org/10.1177/1534484305278283.
Tranfield, D., Denyer, Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. Bri. J. o. Manag. 14, 207–222.
Tukker, A., 2004. Eight types of producteservice system: eight ways to sustainability? Experiences from SusProNet. Bus. Strateg. Environ. 13, 246–260. https://doi.org/10.1002/bse.414.
Tukker, A., 2015. Product services for a resource-efficient and circular economy – a review. J. Clean. Prod. 97, 76–91. https://doi.org/10.1016/j.jclepro.2013.11.049.
UN (United Nations), 2015. Transforming Our World: the 2030 Agenda for Sustainable Development. Available: https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf. (Accessed 7 May 2018).
Urbinati, A., Chiaroni, D., Chiesa, V., 2017. Towards a new taxonomy of circular economy business models. J. Clean. Prod. 168, 487–498. https://doi.org/10.1016/j.jclepro.2017.09.047.
Velte, C.J., Steinhilper, R., 2016. Complexity in a circular economy: a need for rethinking complexity management strategies. In: Proceedings of the World Congress on Engineering Vol II 2016, London, U.K.
Vogtlander, J.G., Scheepens, A.E., Bocken, N.M.B., Peck, D., 2017. Combined analyses of costs, market value and eco-costs in circular business models: eco-efficient value creation in remanufacturing. J. Remanu. 7, 1–17. https://doi.org/10.1007/s13243-017-0031-9.
WBGU (German Advisory Council on Global Change), 2011. World in transition – a social contract for sustainability. Available: http://www.wbgu.de/fileadmin/user_upload/wbgu.de/templates/dateien/veroeffentlichungen/hauptgutachten/jg2011/wbgu_jg2011_en.pdf. (Accessed 7 May 2018).
Whalen, A., Milios, L., Nußholz, J., 2017. Bridging the gap: barriers and potential for scaling reuse practices in the Swedish ICT sector. Resour. Conserv. Recycl. Article (in press) https://doi.org/10.1016/j.resconrec.2017.07.029.
Wirtz, B.W., Pistoia, A., Ullrich, S., Göttel, V., 2016. Business models: origin, development and future research perspectives. Long. Range Plan. 49, 36–54. https://doi.org/10.1016/j.lrp.2015.04.001.
Witjes, S., Lozano, R., 2016. Towards a more Circular Economy: proposing a framework linking sustainable public procurement and sustainable business models. Res., Cons. a. Recy. 112, 37–44. https://doi.org/10.1016/j.resconrec.2016.04.015.
Wittmayer, J., Hölscher, K., Wunder, S., Veenhoff, S., 2018. Transformation research – exploring methods for an emerging research field. Available: https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2018-01-09_texte_01-2018_transformation_research.pdf. . (Accessed 7 May 2018).
Zink, T., Geyer, R., 2017. Circular economy rebound. J. Ind. Ecol. 21, 593–602. https://doi.org/10.1111/jiec.12545.
Zott, C., Amit, R., 2010. Businessmodel design: an activity system perspective. Long. Range Plan. 43, 216–226. https://doi.org/10.1016/j.lrp.2009.07.004.
Zott, C., Amit, R., Massa, L., 2011. The business model: recent developments and future research. J. o. Manage. 37, 1019–1042. Available: http://journals.sagepub.com/doi/abs/10.1177/0149206311406265. (Accessed 11 May 2018).